Exploring Expressive Writing to Reduce Test Anxiety on an Introductory Psychology Exam

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by

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Abstract

Previous research suggests that a brief expressive writing exercise prior to a math exam can help alleviate anxiety and improve test-taking performance. Our study examined the effects of a short seven-minute expressive writing intervention among college students taking a mock introductory psychology exam. A total of *N*=93 students enrolled at The Ohio State University at Lima participated. Students first completed the Cognitive Test Anxiety Scale and a modified version of the Abbreviated Mathematics Anxiety Rating Scale in order to establish how much anxiety they typically experienced during exams. We then randomly assigned participants to either write about their thoughts, feelings, and worries regarding an upcoming exam (experimental condition) or to write about factual content related to the course (e.g., names of theorists, how theories differed from one another, or facts learned in the course; control condition). Students then completed a 51-item mock exam covering content typical of an introductory psychology course. All students rated their anxiety level at multiple time points (i.e. pre and post-intervention, before, during, and after the exam). We found that students in the expressive writing condition had a larger reduction in perceived anxiety from pre to post-intervention compared to the control condition. As predicted, students who engaged in expressive writing scored higher on the exam, relative to controls. However, when we covaried out their pre-study average exam grade, the between group effect vanished. Expressive writing reduced self-reported anxiety before taking a social science exam; however, the effect didn't extend to objective performance on the exam itself. Additional research is needed to better understand how expressive writing may reduce test anxiety and benefit students.

Test anxiety is a type of state anxiety that occurs before and during a period of evaluation, especially in an academic setting (Fernandez, Castillo, & Caurcel, 2015). According to the American Test Anxieties Association (n.d.), about 20% of students have high test anxiety and another 16% have moderate test anxiety. High test anxiety reduces working memory, confuses reasoning, increases mistakes, and lowers test scores (American Test Anxieties Association, n.d.). Prior research concludes that test anxiety may be crippling to students' education (Degges-White & Borzumato-Gainy, 2013). Sarason (1961) found that emotional reactions experienced while a student is suffering from test anxiety lowers a student's intellectual performance. Students who suffer from test anxiety also tend to have lower self-esteem and higher state anxiety more generally which may translate into needing more time to complete an exam. These same students spend more time studying and expect to do poorly on the exam (Alansari, 2004; Foos & Fisher, 1988; Hembree, 1988). Research has also shown that students with test anxiety suffer from fear of evaluation, fear of exams, and have less effective study habits (Hembree, 1988). Furthermore, test anxiety has been linked with high alcohol consumption and is a health concern for students (Kiefer, Cronin, & Gawet, 2006).

Emotionality and worry are two key features used to assess test anxiety (Temple & Nuemann, 2016). Recently, Temple and Nuemann (2016) found that worry predicts exam performance better than emotionality. This is noteworthy given that worry tends to deplete a vital cognitive resource utilized during an examination period; working memory (Park et al., 2014). Working memory is a limited cognitive resource that allows individuals to consciously hold information relevant to complete certain tasks (Just & Carpenter, 1992). Situational experiences such as choking under pressure (Beilock & Carr, 2005) or ruminations regarding gender stereotypes (Schmader & Johns, 2003) seem to deplete working memory capacity as well.

Temple and Neumann (2016) described suppression of worry as another possible explanation for working memory depletion. Over the course of three experiments, the authors found that suppression of worry is detrimental to performance and that bringing the threat of failure to attention prevents suppression, thus freeing up working memory capacity. Given that worry and threat of failure seems to moderate test anxiety, a simple expressive writing intervention where students attend to anxiety concerns could eliminate the aforementioned burdens placed on working memory.

Expressive writing is a clinical method that motivates individuals to regulate important stressors that they are facing by openly writing about their thoughts and feelings (Meshberg-Cohen, Svikis, & McMahon 2011; Pennebaker & Beall, 1986). Park, Ramirez, and Beilock (2014) suggest that working memory is a restricted cognitive resource that contains and manipulates task related information and is vital to hold intermediate processing in the mind. Expressive writing eliminates the burden of worry placed on working memory by allowing individuals to address a stressful experience through re-evaluation (Ramirez & Beilock, 2011). Frattaroli (2006) reviewed a study by Pennebaker (1993) where a majority of participants disclosed expressive writing as helpful because it allowed them to gain insight on what had actually happened to them. Interpreting this and other works, Frattaroli (2006) concluded that expressive writing invokes reasoning, facilitates better regulation of emotions, and aids individuals in sharing emotions socially. Expressive writing, in relation to the college student population, has been found to increase grade point average and improve psychological and physical health (Pennebaker & Francis, 1996).

Park, et al. (2014) studied the effects of expressive writing in high and low math anxious students. They found that expressive writing improved the performance of anxious students in

math-testing situations. The authors first prescreened individuals for math anxiety by administering the Short Math Anxiety Rating Scale and the Cognitive Test Anxiety Scale. Participants were then randomly assigned to two groups. Participants either wrote expressively about their deepest thoughts and feelings regarding an upcoming exam (experimental condition) or sat quietly (control condition). After seven-minutes elapsed, students then began their exam.

The opportunity to write about anxieties and concerns about the upcoming exam significantly reduced impact of math anxiety on math exam performance (Park et al., 2014). Among students in the expressive writing condition, high math anxious students performed similarly to those that were low in math anxiety suggesting that the intervention specifically helped those that were struggling with anxiety. Furthermore, students in the expressive writing condition performed better, on average, on the math exam relative to those in the control condition. Collectively, the results indicated that expressive writing is a cost-effective intervention strategy to reduce test anxiety and improve performance on math tests**.**

In the current study, we set out to examine whether the beneficial effects of expressive writing would generalize to a social science exam. Specifically, we wanted to know whether an expressive writing exercise prior to an introductory psychology exam would lower self-reported anxiety and improve test performance. We were concerned that the control condition instructions employed by Park et al. (2014) might have inadvertently *increased* anxiety. That is, they attempted to create a "business as usual" setting by having students sit quietly and "do nothing" for seven minutes prior to an exam. This situation, however, might have increased anxiety because students might have used the time to think about the upcoming exam and to become anxious about it. Therefore, in order to separate the act of writing from that of *expressive* writing, we wanted both our experimental and control groups to be engaged in writing

during the seven-minute period of time before taking the exam. We provided different instructions to the two groups in terms of the focus or content of their writing. Unlike the expressive writing instructions to write about worries, anxieties and concerns regarding the test, we instructed students in the control group to write about facts, theorist names, and what they previously learned in the course. Our design, then, employed an active control condition (versus the passive control condition used by Park et al., 2014) that rigorously tests the hypothesis that the content of writing is critically important to reducing test anxiety.

If successful, our study would replicate Park et al.'s (2014) finding that expressive writing effectively reduces test anxiety and extend their findings to a subject other than math. Positive findings hold the potential to drastically help students in their current and prospective educational pursuits.

Study Design

In the current study, we looked at the effects of expressive writing on test-anxious students taking an introductory psychology exam. We measured general test anxiety levels by having students complete a modified version of the Abbreviated Mathematics Anxiety Rating Scale (with questions reworded to reflect anxiety about social science exams and coursework) and the Cognitive Test Anxiety Scale. In addition to these measures, we asked students how much anxiety they were experiencing at several time points during the course of the study. We randomly assigned students to one of our two conditions. After seven-minutes of writing, participants completed a mock psychology exam. The main drawback of using a mock exam is that students were unlikely to experience significant anxiety over completing it. In an attempt to increase focus on the individual test items and to potentially enhance anxiety about the test, we instructed participants to indicate how confident they were that they answered correctly. As

noted below, students could report "high" or "low" confidence for each of their answers. We also informed students that they could earn additional points or lose points depending on their confidence rating and whether they answered correctly. In sum, the confidence rating system was intended to make the exam somewhat novel and hopefully enhance the seriousness with which students took the mock exam.

We predict that students in the expressive writing condition would perform better on the exam, be more confident in their answers, and report less anxiety before, during, and perhaps after the exam was finished, relative to those in the control condition. Given past findings that women are more emotionally expressive than men, we also suspected that female participants would express higher levels of anxiety overall relative to male students.

Method

Participants

We recruited participants enrolled in existing introductory psychology classes at The Ohio State University at Lima. Course instructors read our solicitation script informing students that they could earn up to three extra credit points for completing our study on test anxiety. A total of *N*=121 undergraduate students completed a consent form and then completed our study. We excluded 6 students that were unable to adhere to the study procedure (e.g., left the room during the exam, were clearly distracted by their phones during the study), and 19 students that had significant amounts of missing data. Final data analyses were based on *N*=93 (*n*= 47 females; *n*=46 males). The mean age was *M*=19.54 (*SD*=3.38).

Materials

Subjective Social Science and Math Anxiety Questions: In an attempt to measure baseline anxiety levels, participants were asked the following: "Using the following scale, how

much test anxiety do you **typically** experience during a **math** test?" and "Using the following scale, how much test anxiety do you **typically** experience during a **social science** test (*social sciences include subjects like psychology, social work, history, and economics*)?" (boldface included in the original wording within participants' booklets). Students rated their anxiety level on a 0 (None)-10 (Very High) Likert-type scale, for both academic categories.

Social Science Anxiety Scale (SSAS; modified form of the Abbreviated Mathematics Anxiety Rating Scale, Hopko et al., 2003): The AMAS is reported to have high internal consistency α =.90 and high test-retest reliability r =.85. In this study, we reworded items to reflect anxiety about tests in the social sciences (vs. math anxiety). Participants were asked to rate their level of anxiety regarding each scenario on a 5 point Likert-type scale. Two sample items are listed here: "How anxious are you when thinking about an upcoming math test 1 day before?" reworded as "How anxious are you when, thinking about an upcoming social science test 1 day before?" and "How anxious are you when taking an exam in a math course?" reworded as "How anxious are you when taking an exam in a social science course?"

Cognitive Test Anxiety Scale (CTAS; Cassady & Johnson, 2002): This scale assesses general test anxiety and consists of 27 self-report items (e.g., "I lose sleep over worrying about examinations"; "I worry more about doing well on tests than I should"). Participants rate the typicality of each statement (1: not at all typical of me; 2: only somewhat typical of me; 3: quite typical of me; 4: very typical of me) on a 1 to 4 Likert-type scale. Cassady and Johnson (2002), reported that the scale had a high level of internal consistency α=.91 and high validity.

Current-Moment Anxiety Question: Participants rated their "current moment" anxiety at five different time points during the study ["**Right now**, my test anxiety level is ... (circle one number)" (boldface included in original)]. The response format was a 0 "none" to 10 "very

high", with 5 being labeled as "moderate." Participants completed the question multiple times: at the beginning of the study, after completing the anxiety scales listed above, following the writing exercise, after completing the first 10 exam questions, and at the end of the study.

Intensity of Anxiety in Written Narrative (IAWN). Two judges, blind to condition, assessed the written samples provided by participants to determine the degree of expressed anxiety in the written narratives. Judges rated each narrative as consisting of No (0), Low (1), or Moderate to High (2) anxiety. Writing samples were given a (0) when there was no indication of test-anxiety for the individual (e.g. "I am not anxious for this test."), a (1) when individuals made mention of test-anxiety but the anxiety was not very impactful (e.g. "I am anxious but I think I will do fine"), and a (2) when participants mentioned test-anxiety and that the anxiety elicited physiological or psychological symptoms (e.g. "I feel so anxious about the exam I could get sick."). In all but one instance, both judges provided ratings that were close to one another (i.e., did not differ by more than 1 point). For this case, a third judge provided another rating. We then averaged the two ratings to generate an IAWN score for each participant. Higher scores reflected more references to anxiety in the written sample.

Post-Writing Anxiety Reduction: Because we were specifically interested in anxiety levels immediately before and after the writing exercise, we calculated a differ score between current-moment anxiety ratings at time 3 (after the writing exercise) from those at time 2 (before the writing exercise). Higher scores on this measure reflect a greater reduction in anxiety between these two time points.

Total 'Word Count' in Written Narrative (WC): Each narrative was typed into a computer software program (Linguistic Inquiry Word Count; Pennebaker, Booth, Boyd, & Francis, 2015) to determine the number of words written, the number of references to anxiety or

synonyms of anxiety (i.e., Anxiety Synonyms), along with other measures. Linguistic Inquiry Word Count is a word analysis program that categorizes words by psychological relevance (Pennebaker, 2001). This allowed us to calculate the level of emotionality one expressed in their writings.

Social Science Mock Exam: The mock exam consisted of 51 questions selected from the test bank of *Psychology: From Inquiry to Understanding*, 3rd Edition (Lillienfeld et al., 2014). The exam consisted of factual and conceptual questions across four different chapters: Research Methods; Biological Psychology; Sensation and Perception; and, Learning. Ten of these questions were filler items that were added to the end of the exam to keep fast-paced students engaged while others continued working. The filler items were not scored. We summed the number of correct answers across the first 41 items and this score constituted the mock exam score.

Exam Items Confidence Rating: After answering each exam question, participants reported either "high" or "low" confidence in their answer. We informed students that their exam "grade" would be the sum of the number of correct answers. In addition, they could earn an extra point if they a) answered correctly, and b) reported "high confidence." However, if they attached a "high confidence" rating to an incorrect answer, then they would lose a point. Choosing "low confidence" was a safer option in that they would not lose any additional points if they incorrectly answered the question. Total confidence scores were computed by summing confidence ratings across the 41 exam items (the scale is reverse scored meaning that higher scores indicate lower confidence). As noted earlier, the intention of the confidence rating procedure and this "bogus" scoring procedure was to try and heighten anxiety associated with completing the exam.

Procedure

Our two conditions (i.e., expressive vs. control writing) constituted our independent variable. Our main dependent variables were the performance on the exam itself, confidence ratings, and changes in self-reported anxiety levels immediately before and after the writing exercise. We recruited participants from Introductory Psychology classes at OSU Lima to complete a research study regarding the effects of expressive writing on social science test anxiety. Students over the age of 18 were eligible to participate.

On the day of the study, students met in their regular classroom during their scheduled class time. Before participation began, one group was escorted to a room similar to that of their scheduled classroom. Ambient temperature, lighting levels, and the amount of extraneous noise were similar across testing conditions. After signing a consent form, researchers explained that participants would be given a mock exam accompanied by confidence ratings. Students were told that they would earn one point for every correct answer that they provided on the exam. They could earn an additional point for every correct answer accompanied by a high confidence rating. The possibility of earning this additional point was risky however, because a high confidence rating associated with an incorrect answer would cost the student a point. A correct answer with a low confidence rating would benefit a student's score by one point but not risk a secondary point. To ensure procedural understanding, students completed a sample question along with a confidence rating. Although we provided these scoring instructions, in reality, students' exam scores were simply the sum of correct responses and we calculated their average confidence ratings across all 41-exam items regardless of whether they answered correctly or not.

After learning the details of how the exam would be scored, participants answered the subjective math and social science questions. Participants then reported their first current-moment anxiety rating. Afterwards, participants completed the SSAS, CTAS, and the second current moment anxiety rating.

Participants in the expressive writing condition were then given the following instructions: "Please take the next 7 minutes to write as openly as possible about your thoughts and feelings regarding the psychology exam you are about to take. In your writing, I want you to really let yourself go and explore your emotions and thoughts as you are getting ready to start the exam. You might relate your current thoughts to the way you have felt during other similar situations at school or in other situations in your life. Just sit quietly and try to be as open as possible as you write about your thoughts at this time. Please do not talk during this time. Go ahead and do this now." Students in the control condition were instructed to: "Please take the next 7 minutes and write about what you think might be on the upcoming exam. You could write about the different things that you learned in this class, perhaps different theorists' names, their main ideas, how the theories differ from one another; you might write about some of the key terms and their definitions or some of the social science principles that you learned in this class. You might relate what you have learned in this class to other situations in your life. Just sit quietly and write about what you think might be on the exam. Please do not talk during this time. Go ahead and do this now." Students reported their third current moment anxiety rating after the seven minute writing period.

Participants were given 20 minutes to complete the exam. Following the 10th exam question, participants completed the fourth current moment anxiety rating. After 20 minutes, participants were asked to stop the exam and to turn to the last page in their booklet and

complete the fifth and final current moment anxiety rating. We thanked participants for competing our study.

Results

Preliminary Analysis

A preliminary analysis was completed to ensure that randomization produced two groups of students matched on key variables. Students reported being of a similar average age across groups, $F(1,91)=0.76$, $p=.39$. The proportion of males to females was also similar across our groups, $X2(1, N=93)= .27$, $p=.68$. A Multivariate Analysis of Variance (MANOVA) showed that the experimental and control groups, respectively, generated similar average scores across the following indices: the Math Anxiety Question [M=5.69 (SD=2.69) v. M=5.48 (SD=2.58)]; the Social Science Anxiety Question [M=5.20 (SD=1.83) v. M=5.08 (SD=2.38)]; the first administration of the Current-Moment Anxiety Question [(M=3.87 (SD=2.37) v. M=3.50; (SD=2.73)]; the second administration of the current-Moment Anxiety Question [M=4.33 (SD=2.61) v. M=3.65 (SD=2.72)]; the SSAS (M=22.51 (SD=6.07) v. M=22.79 (SD=6.89)]; and the CTAS [(M=68.07 (SD=17.09) v. M=68.33 (SD=16.60)], all Fs(1, 92) < 1.54, all ps >.22.

Manipulation Check. We hypothesized that if the manipulation worked, then individuals in the experimental group would have a higher total word count and a higher number of anxiety synonyms compared to the control group. This hypothesis stems from Park et al.'s (2014) finding of a larger word count overall and a higher anxiety word count for participants in the expressive writing condition. As expected, the experimental group used more words during the writing exercise [WC: M=114.47; (SD=6.41) v. M=64.25 (SD=6.21)], made more reference to anxiety [Anxiety synonyms: M=2.62; (SD=0.23) v. M=0.66 (SD=0.22)], and were judged to

have more anxiety-laden references in their written sample [IAWN: *M*=0.87; (*SD*=0.08) v. *M*=0.05 (*SD*=0.08)] compared with students in the control condition, *F*s > 31.67, *p*s < .001.

Primary Analysis

We conducted a 2 (condition) x 2 (gender) multivariate analysis of variance (MANOVA) on exam scores, confidence reports, and Post-Writing Anxiety Reduction. The multivariate condition by gender interaction and the main effect for gender was not significant, *F*s (3,87) < 0.72, *p*s > .55. We found a main multivariate effect for condition, $F(3,87)=3.66$, $p < .01$ (one tailed test). Univariate analyses revealed that the experimental group (*M*=71.27, *SD*=13.66) performed better on the mock exam relative to the control group (*M*=64.84, *SD*=15.51), $F(1,92)=4.65$, $p=.02$ (one tailed test); and there was a greater change in Post-Writing Anxiety Reduction scores between the experimental (*M*=.64, *SD*=1.38) and control group (*M*= -0.04; *SD*=1.27) as well, $F(1, 92)=6.33$, $p <.01$ (one tailed test). Students in the experimental group gave higher confidence ratings than those in the control group; however, the difference did not reach statistical significance (i.e., $p=.07$, see table 1).

To consider alternative explanations of our findings above, we examined whether students in each group had similar actual grades in the class prior to our study. The results of an analysis of variance (ANOVA) showed that the experimental group (*M*=78.51; *SD*=11.34) had a higher average class grade compared to the control group (*M*=74.17; *SD*=10.31), $F(1, 92)=3.74$, $p=.06$ (See table 1). We needed to account for these pre-existing differences in grade performance prior to when we conducted our study.

In order to do this, we conducted a 2 (condition) x 2 (gender) multivariate analysis of covariance (MANCOVA) on exam scores, confidence reports, and Post-Writing Anxiety

Reduction using students' prior exam score average as a covariate. The multivariate condition by gender interaction and the main effect for gender was not significant, *F*s (3, 86) < 0.55, *p*s > .65. We found a main multivariate effect for condition, $F(3,86)=2.34$, $p=.04$ (one tailed test). Univariate analyses revealed a significant change in Post-Writing Anxiety Reduction scores between the experimental ($M=0.62$, $SD=0.20$) and control groups ($M= -0.01$; $SD=0.19$), $F(1, 92)=5.00$, $p=.02$ (one tailed test; current-moment anxiety ratings across all 5 time points used in this study are depicted in figure 1). In our analysis of covariance, confidence ratings did not differ by condition, $F(1,92)=1.06$, $p=.31$. After accounting for pre-existing grade differences among our participants, there was no effect for expressive writing on mock exam scores, $F(1,92)=1.13$, $p=.25$. The adjusted means showed that the experimental condition still scored slightly better on the mock exam (i.e., they scored 2.34% points higher, on average, than the control group); however, the difference was no longer significant (see table 1).

We conducted a MANOVA on several of our anxiety indices to explore potential gender differences. Across both groups of participants, women scored higher on self-reported anxiety levels across, relative to men, across the following indices: SSAS, CTAS, IAWN, Subjective Math and Subjective Social Science Questions, and WC, *F*s>3.96, *p*s<.05 (See Table 2). Male and female participants did not differ on anxiety-related (i.e., synonym) word counts. We did find that women reported higher anxiety levels overall than men however we did not find any differences between genders within assigned groups (see figure 2).

We conducted correlations between the following measures: Self-reported math and social science anxiety ratings, SSAS, CTAS, and Current Moment Anxiety Questions from Time 2 and Time 3, Post-Anxiety Reduction Scores, and the level of anxiety judged to be in the written narratives (See Table 3).

Discussion

Our results seem to suggest that expressive writing decreases the perceived level of anxiety one feels before taking an exam. However, this reduction in anxiety was not impactful enough to increase actual performance on our mock exam. One explanation for this finding is that expressive writing allows individuals to gain insight about why they may be anxious. In fact it is noted that expressive writing is so effective because individuals are given the opportunity to make sense of and organize an event and apply it to one's self-schema (Frattaroli, 2006; Pennebaker, 1993). Expressive writing may also redirect one to consider positive aspects of a situation that are disregarded when one is anxious (Travagin, Margola, & Revenson, 2015). Travagin et al. (2015) also report in their meta-analytic review that students with high levels of emotional problems had more positive outcomes. This suggests that expressive writing helps to regulate emotions, and this could explain our reduction in self-reported anxiety level following the expressive writing exercise. The question that remains is if the intervention was successful at reducing anxiety, why did this not have an effect on mock exam scores?

We found that once prior grade average was accounted for, students in the expressive writing condition increased exam scores by 2.34% compared to the control group, however this was not statistically significant. There may be several explanations as to why expressive writing did not improve exam scores. Park et al. (2014) found that expressive writing increased test scores among high math anxious students completing difficult math problems. They explained their findings by suggesting that there is a heavy load placed on working memory when a student is highly anxious and is solving a multiple-step math problem. But, if one can relieve this load by expressively writing (i.e., eliminating ruminating thoughts by writing about them), then the student could devote more working memory resources to solving math problems and performing

better on math exams. Perhaps, multiple-step math problems might take up more working memory capacity than is required to complete our mock exam sampling knowledge about introductory psychology. In other words, perhaps our psychology test was not difficult enough or taxing enough on students' working memory in order for expressive writing to show an effect. Our study is limited in that we didn't have enough students to break our sample down into very high vs. low test anxiety students. With a larger sample, we could determine if expressive writing prior to taking a social science test is particularly helpful with students that are already high in test anxiety, as Park et al. (2014) found on math exams. Future research could address this question by pre-selecting participants who specifically struggle with test-anxiety.

Another explanation as to why we did not find that expressive writing increased exam scores is that the positive effects of expressive writing may not be long lasting. Current-moment anxiety ratings showed that anxiety substantially increased (for all students) between just before the exam to 10 questions into the exam. Before the exam, students in the experimental and control condition rated their anxiety level as M=3.69 on a 10 point scale. Ten questions into the exam, the experimental conditioned increased their rating to M=4.22 and the control conditioned increased to M=4.33. If the positive effects of expressive writing (as reflected in a reduction in self-reported anxiety levels) diminished soon after the exam began, then it makes sense that average performance on the exam didn't differ between our groups. This suggests another future research question. Namely, might exam performance improve overall if students would periodically write about their anxieties during an exam (e.g., take a minute or two every 10-15 minutes to write about anxieties)? It is quite possible that students who are given the opportunity to write expressively both before and during the exam, when they feel it is necessary, will show improved performance.

Expressive writing paired with other approaches like using a cue-controlled relaxation technique whereby students first learn relaxation and then pair it with a simple behavioral gesture (e.g., bringing their thumb and forefinger together to make a circle) might be a simple yet effective way to stave off anxiety during an exam. Gunnison (1990) and Lankton (1980) have described the benefits of using anchoring within the context of a post-hypnotic suggestion to help regulate emotions. Or, perhaps a short mindfulness exercise program encouraging students to allow for and to accept anxious thoughts during an exam but not act on them would be a promising addition to the potential benefits of expressive writing prior to taking an exam (see Green & Black, in press, for a description of a short mindfulness training program to enhance concentration and focus on a problem solving task).

We did find that our female participants reported higher levels of anxiety, relative to male participants. This overall pattern was not specific to a given condition, a finding consistent with prior research. For example, Travagin, Margola, and Revenson (2015) reported that gender did not moderate expressive writing effects. Girls and women may experience greater anxiety levels overall, relative to boys and men, or they may be more willing to disclose anxiety symptoms and concerns more broadly (see Hill et al., 2016; McLean, Asnaani, Litz, & Hofmann, 2012). A review by Else-Quest, Hyde, Goldsmith and Van Hulle (2006) found that gender differences in emotionality were negligible in childhood and only emerged during adolescence and adulthood. They suggested that the gender stereotype that women are more emotional than men might actually produce differences in emotional expression in adulthood. Again, future studies with larger samples could more fully address how expressive writing might be moderated by gender as well as by different pre-existing levels of test anxiety.

As you can see from the list of correlations provided in Table 3, our measures of anxiety positively correlated with the CTAS and the SSAS. This was expected given that both of these measures are commonly used scales with established reliability and validity properties.

There seems to be plentiful opportunities and many directions for future research on this topic. A direct extension of this work would be to explore the effects of expressive writing on a social science exam with a larger sample size that includes a larger proportion of highly test-anxious students. Future research may also wish to expand the social science domain to fields like social work, history, economics, and other academic areas.

A major limitation of our study was that students were not as anxious as they would have likely been if facing a real-life testing situation. In addition to assessing self-reported anxiety levels before, during, and following an exam, future researchers could more accurately and objectively monitor physiological markers of anxiety by using recording devices to assess heart rate, blood pressure, and skin conductance levels.

Our results shown in this study are certainly impressive given that only a short seven-minute intervention allowed for anxiety reduction immediately before taking an exam. Our research along with other research that proved expressive writing to increase mood and post-traumatic growth in PTSD clients (Smyth, Hockemeyer, & Tulloch, 2008) and expressive writing to moderate decreased anxiety in healthy individuals (Niles et al., 2014) strengthens the long line of research proving that expressive writing alleviates anxiety provoking symptoms. Our findings suggest that expressive writing can be implemented as a success tool to help students across universities to reduce their anxiety levels. Potentially this could encourage students in their current and prospective educational pursuits.

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Table 1: Group Comparisons across Exam Scores, Confidence and PWAR *with* and *without* Co-varying Class Grade				
	Experimental (*SD/SE*)	Control (*SD/SE*)	*F*	*p (one tail)*
Mock Exam Scores	71.27 (13.66)	64.84 (15.51)	4.65	0.02
Mock Exam Confidence	63.64 (6.40)	65.79 (7.09)	2.20	0.07
Post-Writing Anxiety Reduction	0.64 (1.38)	-0.04 (1.27)	6.33	<.01
Baseline Exam Scores*	78.51 (11.34)	74.17 (10.3)	4.65	.02
Mock Exam Scores*	69.10 (1.55)	66.87 (1.50)	1.11	.15
Mock Exam Confidence*	63.96 (1.00)	65.49 (0.97)	1.06	.15
Post-Writing Anxiety Reduction*	0.62 (0.20)	-0.01 (0.19)	5.00	.02

Table 2: Gender Comparisons across Anxiety Ratings				
	Female (*SD*)	Male (*SD*)	*F*	*p*
Math Anxiety Question	6.11 (2.82)	5.04 (2.31)	3.995	.050
Social Science Anxiety Question	5.85 (1.88)	4.41 (2.13)	11.982	.001
Intensity of Anxiety in Written Narrative	.62 (.75)	.27 (.54)	6.474	.013
SSAS Sum of Scores	24.31 (6.53)	20.95 (6.02)	6.655	.011
CTAS Sum of Scores	74.70 (16.17)	61.57 (14.73)	16.474	.000
Total Word Count: Writing	100.21 (54.38)	76.63 (41.59)	5.501	.021

Table 3: Correlations Among Anxiety Ratings

	Subjective Math Anxiety Question	Subjective Social Science Anxiety Question	SSAS	CTAS	Current Moment Anxiety Rating Time 2	Current Moment Anxiety Rating Time 3	Post-Writing Anxiety Reduction
Subjective Math Anxiety Question	-						
Subjective Social Science Anxiety Question	.326**	-					
SSAS	.443**	.572**	-				
CTAS	.582**	.643**	.630**	-			
Current Moment Anxiety Rating Time 2	.478**	.571**	.613**	.557**	-		
Current Moment Anxiety Rating Time 3	.480**	.610**	.679**	.611**	.866**	-	
Post-Writing Anxiety Reduction	.031	-.029	-.078	-.059	.329**	-.187	-
Intensity of Anxiety in Written Narrative	.107	.329**	.312**	.306**	.415**	.360**	.135

NOTE: Correlations without an asterisk are not significant at the .05 level
**** Correlation is significant at the .01 level (2-tailed)**

Figure 1: Subjective Anxiety Ratings Across Study by Group

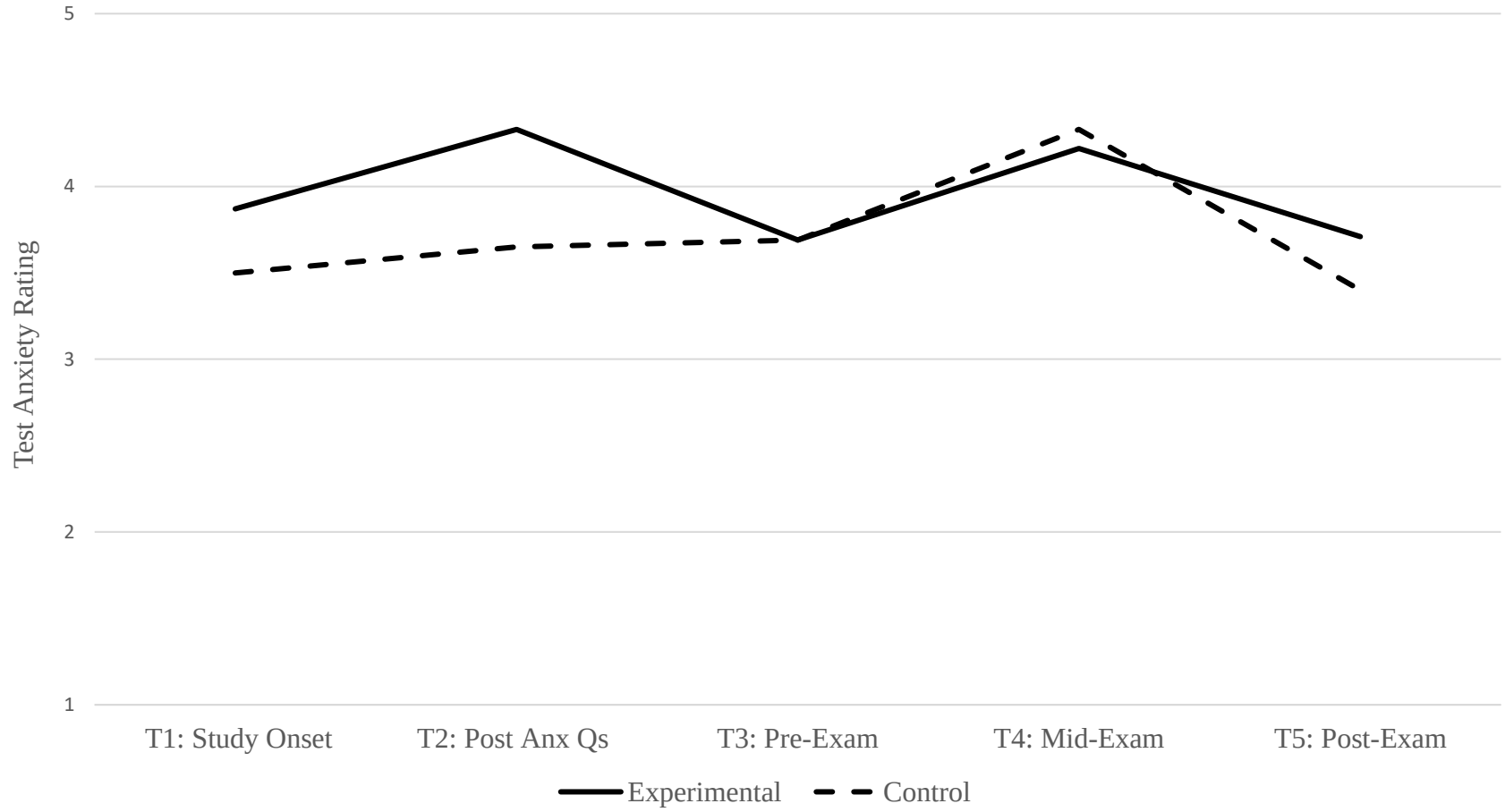

Figure 2: Subjective Anxiety Ratings Across Study by Gender